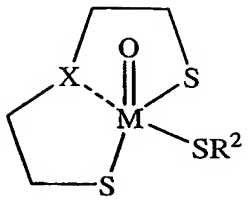
What is claimed is:

1. A compound having the formula I



I

wherein

M is a radionuclide;

X is oxygen, sulfur, or NR^1; and

R^1 and R^2 are, independently, an alkyl group, a cycloalkyl group, a heterocycloalkyl group, an alkenyl group, an alkynyl group, an aryl group, a heteroaryl group, an aralkyl group, or a combination thereof,

wherein R^1 and R^2 can be substituted with one or more groups comprising an alkoxy group, a hydroxy group, an amine group, a thio group, an amide, an ester, a carbonate group, a carboxylic acid, an aldehyde, a keto group, an ether group, a halide, a urethane group, a silyl group, or a sulfo-oxo group.

2. The compound of claim 1, wherein M is technetium or rhenium.

3. The compound of claim 1, wherein M is ^{99m}Tc, ^{186}Re or ^{188}Re.

4. The compound of claim 1, wherein X is NR^1.

5. The compound of claim 1, wherein X is NR^1 and R^1 is an alkyl group.

6. The compound of claim 1, wherein X is NR^1 and R^1 is a straight chain alkyl group.

7. The compound of claim 1, wherein X is NR^1 and R^1 is an alkyl group that contains at least one nitrogen atom.

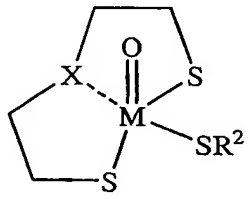
8. The compound of claim 1, wherein X is NR^1 and R^2 has one nitrogen atom and one sulfur atom.

9. The compound of claim 1, wherein X is NR^1 and R^2 has two nitrogen atoms and one sulfur atom.

10. The compound of claim 1, wherein X is NR^1, R^1 is $CH_2CH_2NEt_2$, R^2 is $CH_2CH_2N(CH_2CH_2SH)(CH_2CH_2NEt_2)$, and M is ^{99m}Tc, ^{186}Re or ^{188}Re.

11. The compound of claim 1, wherein X is NR^1, R^1 is $CH_2CH_2CH_2CH_3$, R^2 is $CH_2CH_2N(CH_2CH_2SH)(CH_2CH_2CH_2CH_3)$, and M is ^{99m}Tc, ^{186}Re or ^{188}Re.

12. A radiolabeled liposome comprising a liposome and a compound having the formula I



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wherein R^1 and R^2 can be substituted with one or more groups comprising an alkoxy group, a hydroxy group, an amine group, a thio group, an amide, an ester, a carbonate group, a carboxylic acid, an aldehyde, a keto group, an ether group, a halide, a urethane group, a silyl group, or a sulfo-oxo group,

wherein the compound is incorporated or attached to the liposome.

13. The radiolabeled liposome of claim 12, wherein the liposome further comprises a drug that is incorporated within the liposome.

14. The radiolabeled liposome of claim 13, wherein the drug is a compound comprising at least one thiol group.

15. The radiolabled liposome of claim 14, wherein the drug reacts with the compound having the formula I.

16. The radiolabeled liposome of claim 13, wherein the drug comprises glutathione, cysteine, N-acetyl cysteine, 2-mercaptosuccinic acid, 2,3-dimercaptosuccinic acid, captopril or a combination thereof.

17. The radiolabeled liposome of claim 12, wherein the liposome comprises a lipid.

18. The radiolabeled liposome of claim 12, wherein the liposome comprises a phospholipid.

19. The radiolabeled liposome of claim 12, wherein the liposome comprises a cholesterol or a cholesterol analogue.

20. The radiolabeled liposome of claim 18, wherein the liposome comprises distearoyl phosphatidylcholine.

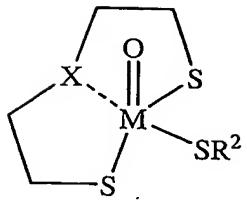
21. The radiolabeled liposome of claim 12, wherein the amount of radionuclide attached or incorporated into the liposome is from about 0.01 mCi to about 400 mCi per 50 mg of lipid that is used to prepare the liposome.

22. The radiolabeled liposome of claim 12, wherein the liposome further comprises a chemotherapeutic agent, an antibiotic agent or a treatment molecule, wherein the chemotherapeutic agent, the antibiotic agent, or the treatment molecule is incorporated or attached to the liposome.

23. A method of making a radiolabeled liposome, comprising mixing

a. a liposome having an outer space and an inner volume, wherein the pH of the inner volume of the liposome is less than the pH of the outer space of the liposome, with

b. a compound having the formula I



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wherein R^1 and R^2 can be substituted with one or more groups comprising an alkoxy group, a hydroxy group, an amine group, a thio group, an amide, an ester, a carbonate group, a carboxylic acid, an aldehyde, a keto group, an ether group, a halide, a urethane group, a silyl group, or a sulfo-oxo group,

wherein after components (a) and (b) are mixed, the compound is incorporated or attached to the liposome.

24. The method of claim 23, wherein the pH of the inner volume of the liposome is acidic and the pH of the outer space of the liposome is neutral, basic, or a physiological pH.

25. The method of claim 23, wherein the inner volume of the liposome contains a compound comprising at least one amine group or at least one carboxyl group.

26. The method of claim 23, wherein the inner volume of the liposome contains ammonium sulfate.

27. The method of claim 23, wherein the pH of the inner volume is from about 4 to about 7 and the pH of the outer space is from about 6 to about 7.4.

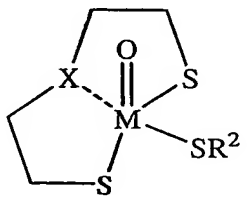
28. The method of claim 23, wherein after the liposome and the compound having the formula I are mixed, the radiolabeled liposome is incubated at from 25 °C to 37 °C for 0.5 to 2 hours.

29. The radiolabeled liposome produced by the method of claim 23.

30. A method of making a radiolabeled liposome, comprising mixing

a. a liposome having an outer space and an inner volume, wherein a drug comprising at least one thiol group is incorporated within the inner volume of the liposome, with

b. a compound having the formula I



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wherein after components (a) and (b) are mixed, the compound is incorporated into the liposome.

31. The method of claim 30, wherein the drug reacts with the compound having the formula I.

32. The method of claim 30, wherein the drug comprises glutathione, cysteine, N-acetyl cysteine, or a combination thereof.

33. The method of claim 30, wherein after the liposome and the compound having the formula I are mixed, the radiolabeled liposome is incubated at from 25 °C to 37 °C for 0.5 to 2 hours.

34. A radiolabeled liposome made by the method of claim 30.

35. The use of the radiolabeled liposome of claim 12 as an imaging agent, comprising administering the radiolabeled liposome to a subject and measuring or detecting the amount of radiation emitted from the radionuclide of the compound having the formula I.

36. The use of claim 35, wherein the radiolabeled liposome comprises technetium.

37. The use of the radiolabeled liposome of claim 12 to treat a disease in a subject, comprising administering the radiolabeled liposome to the subject.

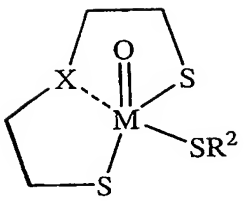
38. The use of claim 37, wherein the disease is cancer.

39. The use of claim 37, wherein the radiolabeled liposome comprises rhenium.

40. A kit comprising

a. a liposome having an outer space and an inner volume, wherein the pH of the inner volume of the liposome is less than the pH of the outer space of the liposome, and

b. a compound having the formula I



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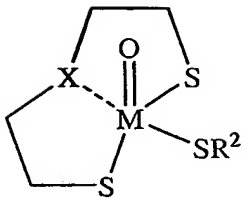
41. A kit comprising

a. a liposome having an outer space and an inner volume, wherein a drug comprising at least one thiol group is incorporated within the inner volume of the liposome, and

b. a compound having the formula I



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